What is claimed is:

1. A particulate blend for use as a catalytic composition, comprising a mixture of the following components:

(i) about 15 to 35 wt. % silicon dioxide,

(ii) about 1 to 6 wt. % aluminum oxide,

(iii) about 5 to 20 wt. % ferric oxide,

(iv) about 10 to 30 wt. % calcium oxide,

(v) about 2 to 4 wt. % titanium dioxide or boron oxide, and

(vi) about 8 to 12 wt. % transition metal salt,

said wt. % being based on the total weight of components (i) – (vi), and wherein the particles of said components have a particle size of 3000 Blaine or finer.

2. The particulate blend of claim 1 wherein the transition metal salt is selected from the group of ferric halides, cupric halides, cobalt halides, and ferrous halides.

3. An aqueous catalytic composition comprising an admixture in water of the reaction products of the following components:

(i) about 15 to 35 wt. % silicon dioxide,

(ii) about 1 to 6 wt. % aluminum oxide,

(iii) about 5 to 20 wt. % ferric oxide,

(iv) about 10 to 30 wt. % calcium oxide,

(v) about 2 to 4 wt. % titanium dioxide or boron oxide, and

(vi) about 8 to 12 wt. % transition metal salt,

said wt. % being based on the total weight of components (i) - (vi), wherein the particles of said components have a particle size of 3000 Blaine or finer, and, optionally,

(vii) up to 50 wt. % refined hydrocarbon, based on the total weight of the admixture.

4. The catalytic composition of claim 3 wherein the transition metal salt is selected from the group of ferric halides, cupric halides, cobalt halides, and ferrous halides.

5. The catalytic composition of claim 3 wherein the refined hydrocarbon is a $C_5$ to $C_{25}$ saturated alkane.

6. The catalytic composition of claim 5 wherein the saturated alkane is diesel fuel or naphtha.

7. A method of making an aqueous catalytic composition which comprises:

(a) admixing the following solid particles:

(i) about 15 to 35 wt.% silicon dioxide,

(ii) about 1 to 6 wt.% aluminum oxide,

(iii) about 5 to 20 wt.% ferric oxide,

(iv) about 10 to 30 wt.% calcium oxide,

(v) about 2 to 4 wt.% titanium dioxide or boron oxide, and

(vi) about 8 to 12 wt.% transition metal salt,

said wt.% being based on the total weight of components (i) - (vi), wherein the particles of said components have a particle size of 3000 Blaine or finer;

(b) blending said admixture from step (a) with water to form an admixture with about 2 to 10 wt.% solid components;

(c) optionally admixing up to 50 wt.% of a refined hydrocarbon, based on the total weight of the admixture, with the admixture from step (b); and

(d) blending said admixture from step (c).

8. A composition for the upgrading of a high molecular weight hydrocarbon composition to form a lower molecular weight hydrocarbon product,

comprising:

(a) an aqueous composition containing the reaction products of the following components:

(i) about 15 to 35 wt.% silicon dioxide,

(ii) about 1 to 6 wt.% aluminum oxide,

(iii) about 5 to 20 wt.% ferric oxide,

(iv) about 10 to 30 wt.% calcium oxide,

(v) about 2 to 4 wt.% titanium dioxide or boron oxide, and

(vi) about 8 to 12 wt.% transition metal salt,

said wt.% being based on the total weight of components (i) - (vi), wherein the particles of said components have a particle size of 3000 Blaine or finer, and, optionally,

(vii) up to 50 wt.% refined hydrocarbon, based on the total weight of the admixture; and

(b) a high molecular weight hydrocarbon, the weight ratio of the high molecular weight hydrocarbon to the aqueous composition being from 2:1 to 4:1.

9. The composition of claim 8 wherein the transition metal salt is selected from the group of ferric halides, cupric halides, cobalt halides, and ferrous halides.

10. The composition of claim 8 wherein the refined hydrocarbon is a $C_5$ to $C_{25}$ saturated alkane.

11. The composition of claim 10, wherein the saturated alkane is diesel fuel or naphtha.

12. A method of cracking a high molecular weight hydrocarbon composition to form a lower molecular weight hydrocarbon product, comprising:

(a) contacting an aqueous catalytic composition having a

solids content of about 2 to 10 wt.% of the total weight of the catalytic composition with a high molecular weight hydrocarbon product in a ratio of from 2:1 to 4:1, said solids comprising, based on the total wt.% of solids:

(i) about 15 to 35 wt.% silicon dioxide,

(ii) about 1 to 6 wt.% aluminum oxide,

(iii) about 5 to 20 wt.% ferric oxide,

(iv) about 10 to 30 wt.% calcium oxide,

(v) about 2 to 4 wt.% titanium dioxide or boron oxide, and

(vi) about 8 to 12 wt.% transition metal salt

said catalytic composition further containing up to 50 wt.% refined hydrocarbon; and

(b) recovering the lower molecular weight hydrocarbon product formed in step (a), said lower molecular weight product having an average API value greater than the API value of the high molecular weight hydrocarbon composition.

13. The method of claim 12 wherein the transition metal salt is selected from the group of ferric halides, cupric halides, cobalt halides, and ferrous halides.

14. The method of claim 12 wherein the refined hydrocarbon is a $C_5$ to $C_{25}$ saturated alkane.

15. The method of claim 14 wherein the saturated alkane is diesel fuel or naphtha.

16. The method of claim 12 wherein the high molecular weight hydrocarbons are in soil containing organic impurities and said method decontaminates the soil.

17. A particulate blend for use as a catalytic composition, comprising a mixture of the following components:

(i) about 30 to 50 wt.% Portland cement,

(ii) about 30 to 50 wt.% volcanic ash,

(iii) about 2 to 4 wt.% titanium dioxide or boron oxide, and

(iv) about 8 to 12 wt.% transition metal salt,

said wt.% being based on the total weight of components (i) – (iv), and wherein the particles of said components have a particle size of 3000 Blaine or finer.

18. The particulate blend of claim 17 wherein the volcanic ash is pyroclastic rock, tuff, tuffstone, volcanic glass, pumice, scoria, mafic rock, ultramafic rock, or silicate-based zeolites.

19. The particulate blend of claim 17 wherein the transition metal salt is selected from the group of ferric halides, cupric halides, cobalt halides, and ferrous halides.

20. An aqueous catalytic composition comprising an admixture in water of the reaction products of the following components:

(i) about 30 to 50 wt.% Portland cement,

(ii) about 30 to 50 wt.% volcanic ash,

(iii) about 2 to 4 wt.% titanium dioxide or boron oxide, and

(iv) about 8 to 12 wt.% transition metal salt,

said wt.% being based on the total weight of components (i) - (iv), wherein the particles of said components have a particle size of 3000 Blaine or finer, and, optionally,

(v) up to 50 wt.% refined hydrocarbon, based on the total weight of the admixture.

21. The catalytic composition of claim 20 wherein the volcanic ash is pyroclastic rock, tuff, tuffstone, volcanic glass, pumice, scoria, mafic rock, ultramafic rock, or silicate-based zeolites.

22. The catalytic composition of claim 20 wherein the transition metal salt is selected from the group of ferric halides, cupric halides, cobalt halides, and ferrous halides.

23. The catalytic composition of claim 20 wherein the refined hydrocarbon is a $C_5$ to $C_{25}$ saturated alkane.

24. The catalytic composition of claim 23 wherein the saturated alkane is diesel fuel or naphtha.

25. A method of making an aqueous catalytic composition which comprises:

(a) admixing the following solid particles:

(i) about 30 to 50 wt.% Portland cement,

(ii) about 30 to 50 wt.% volcanic ash,

(iii) about 2 to 4 wt.% titanium dioxide or boron oxide, and

(iv) about 8 to 12 wt.% transition metal salt,

said wt.% being based on the total weight of components (i) -(iv), wherein the particles of said components have a particle size of 3000 Blaine or finer;

(b) blending said admixture from step (a) with water to form an admixture with about 2 to 10 wt.% solid components;

(c) optionally admixing up to 50 wt.% of a refined hydrocarbon, based on the total weight of the admixture, with the admixture from step (b); and

(d) blending said admixture from step (c).

26. A composition for the upgrading of a high molecular weight hydrocarbon composition to form a lower molecular weight hydrocarbon product, comprising:

(a) an aqueous composition containing the reaction products

of the following components:

(i) about 30 to 50 wt.% Portland cement,

(ii) about 30 to 50 wt.% volcanic ash,

(iii) about 2 to 4 wt.% titanium dioxide or boron oxide, and

(iv) about 8 to 12 wt.% transition metal salt,

said wt.% being based on the total weight of components (i) - (iv), wherein the particles of said components have a particle size of 3000 Blaine or finer, and, optionally,

(v) up to 50 wt.% refined hydrocarbon, based on the total weight of the admixture; and

(b) a high molecular weight hydrocarbon, the weight ratio of the high molecular weight hydrocarbon to the aqueous composition being from 2:1 to 4:1.

27. The composition of claim 26 wherein said high molecular weight hydrocarbon product is selected from the group of bitumens, asphaltenes, oils, and tars.

28. The composition of claim 26 wherein the volcanic ash is pyroclastic rock, tuff, tuffstone, volcanic glass, pumice, scoria, mafic rock, ultramafic rock, or silicate-based zeolites.

29. The composition of claim 26 wherein the transition metal salt is selected from the group of ferric halides, cupric halides, cobalt halides, and ferrous halides.

30. The composition of claim 26 wherein the refined hydrocarbon is a $C_5$ to $C_{25}$ saturated alkane.

31. The composition of claim 30 wherein the saturated alkane is diesel fuel or naphtha.

32. A method of cracking a high molecular weight hydrocarbon composition to form a lower molecular weight hydrocarbon product, comprising:

(a) contacting an aqueous catalytic composition having a solids content of about 2 to 10 wt.% of the total weight of the catalytic composition with a high molecular weight hydrocarbon product in a ratio of from 2:1 to 4:1, said solids comprising, based on the total wt.% of solids:

(i) about 30 to 50 wt.% Portland cement,

(ii) about 30 to 50 wt.% volcanic ash,

(iii) about 2 to 4 wt.% titanium dioxide or boron oxide, and

(iv) about 8 to 12 wt.% transition metal salt,

said catalytic composition further containing up to 50 wt.% refined hydrocarbon, based on the total weight of the admixture; and

(b) recovering the lower molecular weight hydrocarbon product formed in step (a), said lower molecular weight product having an average API value greater than the API value of the high molecular weight hydrocarbon composition.

33. The method of claim 32 wherein said high molecular weight hydrocarbon product is selected from the group of bitumens, asphaltenes, oils, and tars.

34. The method of claim 32 wherein the volcanic ash is pyroclastic rock, tuff, tuffstone, volcanic glass, pumice, scoria, mafic rock, ultramafic rock, or silicate-based zeolites.

35. The method of claim 32 wherein the transition metal salt is selected from the group of ferric halides, cupric halides, cobalt halides, and ferrous halides.

36. The method of claim 32 wherein the refined hydrocarbon is a $C_5$ to $C_{25}$ saturated alkane.

37. The method of claim 36 wherein the saturated alkane is diesel fuel or naphtha.

38. The method of claim 32 wherein the high molecular weight hydrocarbons are in soil containing organic impurities and said method decontaminates the soil.

39. An aqueous catalytic composition comprising an admixture of a refined hydrocarbon and water containing the reaction products of the following components: silicon dioxide, aluminum oxide, ferric oxide, calcium oxide, titanium dioxide or boron oxide, and a transition metal salt, wherein the particles are finely divided.

40. The catalytic composition of claim 39 wherein the transition metal salt is selected from the group of ferric halides, cupric halides, cobalt halides, and ferrous halides.

41. The catalytic composition of claim 39 wherein the refined hydrocarbon is a $C_5$ to $C_{25}$ saturated alkane.

42. The catalytic composition of claim 41 wherein the saturated alkane is diesel fuel or naphtha.

43. A method of making a catalytic composition which comprises:

(a) admixing the finely divided particles of silicon dioxide, aluminum oxide, ferric oxide, calcium oxide, titanium dioxide or boron oxide, and a transition metal salt;

(b) blending said admixture from (a) with water and a refined hydrocarbon.

44. A composition for the upgrading of a high molecular weight hydrocarbon composition to form a lower molecular weight hydrocarbon product, comprising an aqueous composition containing the reaction products of the following

finely divided components: silicon dioxide, aluminum oxide, ferric oxide, titanium dioxide or boron oxide, a transition metal salt, and, optionally, a refined hydrocarbon and a high molecular weight hydrocarbon product.

45. The composition of claim 44 wherein the transition metal salt is selected from the group of ferric halides, cupric halides, cobalt halides, and ferrous halides.

46. The composition of claim 44 wherein the refined hydrocarbon is a $C_5$ to $C_{25}$ saturated alkane.

47. The composition of claim 46, wherein the saturated alkane is diesel fuel or naphtha.

48. A method of cracking a high molecular weight hydrocarbon composition to form a lower molecular weight hydrocarbon product, comprising:

(a) contacting an aqueous catalytic composition containing finely divided silicon dioxide, aluminum oxide, ferric oxide, calcium oxide, titanium dioxide or boron oxide, transition metal salt, and a refined hydrocarbon with a high molecular weight hydrocarbon; and

(b) recovering the lower molecular weight hydrocarbon product formed in step (a), said lower molecular weight product having an average API value greater than the API value of the high molecular weight hydrocarbon composition.

49. The method of claim 48 wherein the transition metal salt is selected from the group of ferric halides, cupric halides, cobalt halides, and ferrous halides.

50. The method of claim 48 wherein the refined hydrocarbon is a $C_5$ to $C_{25}$ saturated alkane.

51. The method of claim 50 wherein the saturated alkane is diesel fuel or naphtha.